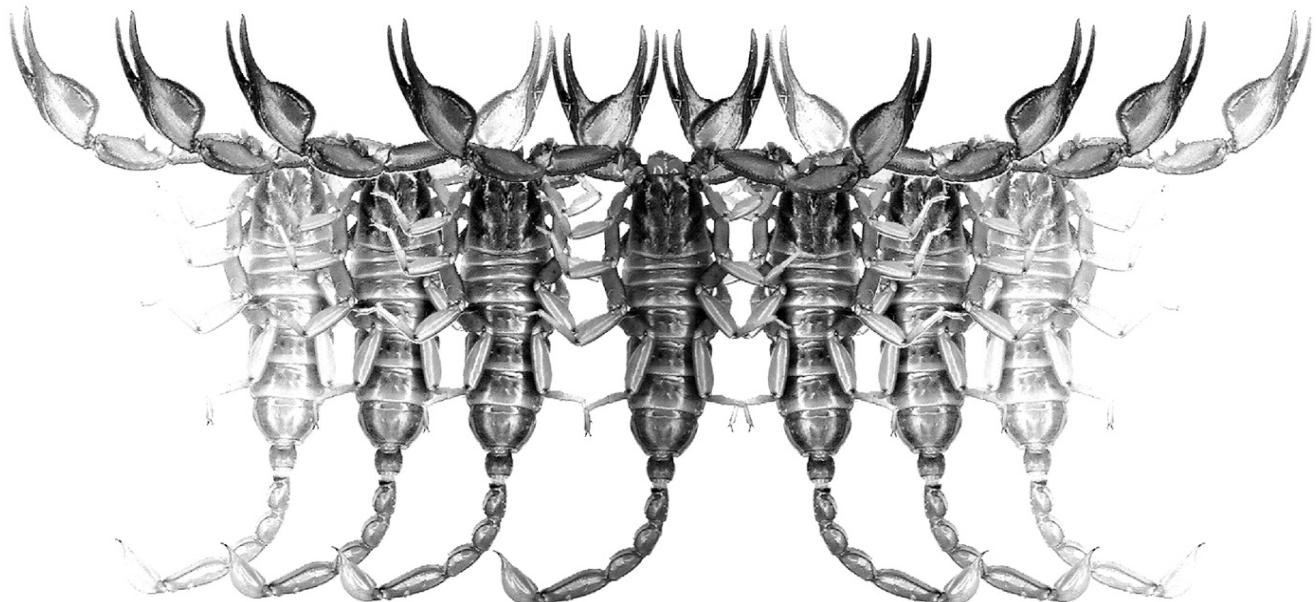


Euscorpius

Occasional Publications in Scorpiology



**First record of the genus *Compsobuthus*
(Scorpiones: Buthidae) from Maharashtra,
India, with description of a new species**

Vivek Waghe, Satpal Gangalmale & Akshay Khandekar

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Euscorpius

Occasional Publications in Scorpiology

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First record of the genus *Compsobuthus* (Scorpiones: Buthidae) from Maharashtra, India, with description of a new species

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Summary

A new species of the genus *Compsobuthus* Vachon, 1949 (Buthidae) belonging to the *wernerii* group is described from two localities in Jalgaon District, Maharashtra, India. The new species can be easily distinguished from all four members of the *wernerii* group known from India and Pakistan by combination of nonoverlapping morphological characters. *Compsobuthus satpuraensis* sp. n. is the first species of this genus to be reported from the state of Maharashtra and fourth to be reported from India.

Introduction

The buthid genus *Compsobuthus* is currently represented by 50 species distributed throughout central Africa, the Arabian Peninsula, and from the Middle East to Pakistan & India (Sissom, 1990; Kovářík & Ojanguren, 2013; Rein, 2021). The genus was first established by Vachon in 1949 to accommodate *Buthus acutecarinatus* Simon, 1882 on the basis of fusion of the central median and posterior median carinae of the carapace into a single continuous linear keel. In his revision of North African scorpions, Vachon (1952) defined the two species groups within the genus, namely *wernerii* and *acutecarinatus*, based on the presence or absence of external accessory granules on pedipalp chela fingers, which are present in *C. wernerii* (Birula, 1908) and absent in *C. acutecarinatus* group. Levy & Amitai (1980) further clarified the groups and defined the genus *Compsobuthus* as having central median and posterior median carinae of carapace fused and projecting beyond posterior margin as distinct spiniform processes. Sissom (1990) listed 12 species, and Fet & Lowe (2000) listed 15 species and two subspecies in the genus *Compsobuthus*. Still, taxonomy of the genus remained unresolved and poorly studied (Levy & Amitai, 1980; Sissom, 1994; Lourenço & Monod, 1998; Fet & Lowe, 2000). Detailed taxonomic work over the last two decades has clarified the status of the genus and of some species, and a large number of new species was described as well (Lourenço, 2001; Kovářík, 2003, 2012, 2018a, 2018b; Navidpour et al., 2011; Kovářík & Ojanguren-Affilastro, 2013; Kovářík et al., 2016; Rein, 2021).

In India and Pakistan together, the genus *Compsobuthus* is represented by five species, out of which two species (*C. pakistanicus* Kovářík & Ahmed, 2007, and *C. sindicus* Kovářík

& Ahmed, 2011) are described and known only from Pakistan. *C. astrostriatus* (Pocock, 1897) is described from Pakistan but Tikader & Bastawade, (1983) reported it from India as well; *C. rugosulus* (Pocock, 1900) is described and known from both India and Pakistan (Lourenço & Monod (1998) considered Pakistan as its type locality); and *C. andresi* Lourenço, 2004 is currently the only species having its type locality in India.

Out of all Indian and Pakistani congeners, only *C. andresi* is a member of the *acutecarinatus* group, while the rest belong to the *wernerii* group. In India, *C. andresi* is known only from its type locality (NE of Jaunpur in Uttar Pradesh); *C. rugosulus* from Gwalior in Madhya Pradesh, Barmer District in Rajasthan, and from an unknown locality in Gujarat State; and *C. astrostriatus* was recorded from Jodhpur, Jaisalmer, Bikaner and Barmer Districts in Rajasthan (Pocock, 1900; Tikader & Bastawade, 1983; Fet & Lowe 2000; Bastawade, 2004; Lourenço, 2004).

During the recent scorpion survey of non-protected areas in northern Maharashtra, we collected two scorpions of the genus *Compsobuthus* from two closely spaced localities in Jalgaon District. A detailed morphological examination revealed that the collected samples together differ from the congeners in several non-overlapping morphological characters. In this paper, we describe them together as a new species based solely on their distinctive morphology.

Material and methods

Scorpions were located by flipping rocks during the day time and collected by forceps, locality data were recorded by using Google map, photographs of a live specimen (female) were made using Vivo Y95 mobile camera. Specimens were



Figures 1–2. *Compsobuthus satpuraensis* sp. n., female holotype in vivo habitus.

preserved in 8% formaldehyde for three days, washed and kept in tap water for ~12 hours, and then transferred into 70% ethyl alcohol for long-term storage. The specimens were examined under a ZEISS Stemi 305 stereo dissecting microscope, measurements were made with Mitutoyo digital vernier caliper (to the nearest 0.01). Nomenclature and measurements follow Stahnke (1971) and Sissom (1990), except for cheliceral dentition, sternum, and lateral eyes we follow Vachon (1963), Soleglad & Fet (2003), and Loria & Prendini (2014), respectively. Abbreviations are as follows: Lt (left), Rt (right), L (length), W (width).

Specimens are deposited in the Museum and Research Collection Facility at the National Centre for Biological Sciences, Bengaluru (NRC-AA) and Bombay Natural History Society, Mumbai, India (BNHS).

Systematics

Family Buthidae C.L. Koch, 1837

Genus *Compsobuthus* Vachon, 1949

***Compsobuthus satpuraensis* sp. n.**

(Figures 1–22, Table 1)

<http://zoobank.org/urn:lsid:zoobank.org:act:B7BABC18-0EA7-4BCE-9D1E-86497DD60AAE>

TYPE LOCALITY AND TYPE DEPOSITORY. **India**, Maharashtra State, Jalgaon District, Waghzira Village, foothills of Satpura Hill Range 21°16'29.0"N 75°35'12.0"E; 310 m a. s. l. BNHS.

TYPE MATERIAL. **India**, Maharashtra State, Jalgaon District, Waghzira Village, foothills of Satpura Hill Range, 21°16'29.0"N 75°35'12.0"E; 310 m a. s. l., 1♀ (holotype, BNHS SC 172), 15 December 2020; Khiroda Village, foothills of Satpura Hill Range, 21°13'16.4"N 75°53'11.6"E; 260 m a. s. l., 1♂ (paratype, NRC-AA-1184), 20 October 2020; both leg. J. Badgujar, M. Chavan, P. Mahure & V. Waghe.

ETYMOLOGY. The specific epithet is a toponym for Satpura Hills; the species is currently only known from the foothills of this hill range in Jalgaon District of Maharashtra.

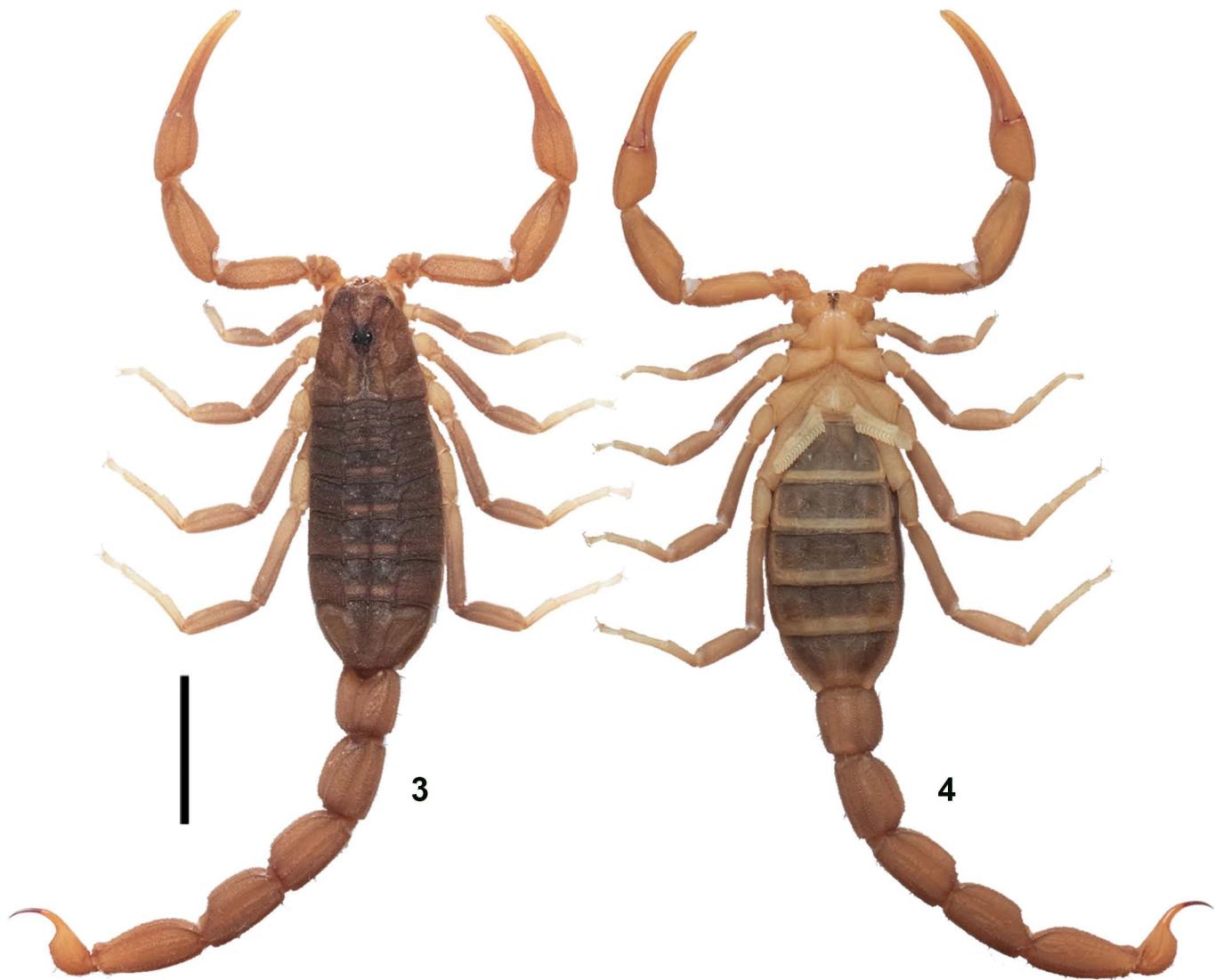
DIAGNOSIS. Medium-sized *Compsobuthus*, with maximum total length 37 mm (n=2). Overall coloration reddish to reddish brown, black pigments between median eyes and around the lateral eyes, metasomal segments I–V yellow to yellowish brown, male overall darker than female. Central median and posterior median carinae of carapace fused and carinae projecting beyond posterior margin as distinct spiniform processes. Median eyes situated in the ratio 1:1.35. Carapace longer than wide in both sexes; carapace longer than patella in both sexes but longer than metasomal segment V only in female. Tergites I–VI tricarinate, carinae projecting beyond posterior margin as distinct spiniform processes, tergite VII with four complete carinae and a median incomplete carina on distal half. Sternites II–III with two granular carinae. Sternum type 1; pectinal teeth number 16 or 17 in female

and 17 or 18 in male. All metasomal segments longer than wide in both sexes. Metasomal segment I (female/male, L/W ratio) 1.05/1.06, segment II 1.38/1.38, segment III 1.52/1.47, segment IV 1.78/1.70 and segment V 2.17/2.02. Metasomal segment I with 10 complete carinae; metasoma II–III with 10 carinae of which lateral carinae reduced by 3–6 granules on distal part; segment IV with 10 complete carinae, of which lateral carinae on either sides are weaker; segment V with five complete carinae. Movable fingers of chela pedipalps with 11 or 12 cutting rows of granules with five terminal granules including single basal terminal granule; external and internal accessory granules present at all rows. Femur of pedipalps with five complete carinae, patella with eight complete carinae and chela with four complete carinae, and a single incomplete carina on lateroexternal and dorsoexternal aspects respectively. Chela robust and moderately granulated; less than five times longer than wide in both sexes. Trichobothrial pattern Type A, Orthobothrioxic, dorsal trichobothria of femur arranged in β configuration. Trichobothrium *db* situated on the fixed finger of chela manus basal to *est*. Tibia and tarsomere I of all legs with granular carinae.

DESCRIPTION (Based on holotype) Measurements are given in Table 1, abbreviations in Materials and methods. The holotype is in good condition except leg I of left side without tarsomeres I & II; *d*, absent on the femur of right pedipalp.

Coloration. (Figs. 1–4) Carapace reddish brown, black pigments between median eyes and around the lateral eyes. Tergite brownish overall, distal half darker and proximal half much paler in tergites I–VI, VII paler entirely. Metasoma I–II yellowish brown, metasoma III–V reddish brown. Vesicle yellowish brown with base of aculeus reddish brown and tip reddish black. Femur and patella of pedipalps reddish brown, chela yellowish brown, fingers reddish brown, tip of fingers yellowish brown. Sternites I–V yellowish brown. All legs on coxa-trochanter, femur, and patella brownish; tibia and tarsomere I–II yellowish; tip of lateral and median claws reddish.

Carapace and mesosoma (Figs. 8–10). Carapace longer than wide, sub rectangular in shape, dorsoventrally compressed and heavily granulated. Median eyes medially raised and situated in the ratio 1:1.35, five pairs of lateral eyes with three large and two small ocelli in ‘type 5’ pattern as described by Loria & Prendini (2014); anterior median, central median and posterior median carinae well developed with large granules; anterior lateral and median lateral carinae developed with moderate sized granules; central median and posterior median carinae fused and carinae projecting beyond posterior margin as distinct spiniform processes (Fig. 8). Cheliceral dentition as typical for family Buthidae (Vachon, 1963); with two reduced denticles at the base of the ventral aspect of the fixed finger. Mesosoma dorsoventrally compressed, heavily granulated. Tergites I–VI tricarinated, carinae projecting beyond posterior margin as distinct spiniform processes; tergite VII with four complete carinae and single incomplete median carina present on distal half (Fig. 10). All sternites sparsely hirsute, with



Figures 3–4. *Compsobuthus satpuraensis* sp. n., female holotype, in dorsal (3) and ventral (4) views. Scale bar = 5 mm.

fine and moderate granulation. Sternites I–IV with a pair of small slit-like stigmata for book lungs; sternite I lacks carinae, II–III with single pair of weak granular carinae, IV–V with two pairs of carinae (Fig. 6). Sternum subtriangular with a small depression in the posterior median portion, similar to ‘type 1’ described by (Soleglad & Fet, 2003). Genital operculum smooth except weak granulation on the lateral edges, divided longitudinally, each plate semi-triangular in shape. Pectinal teeth count (Lt/Rt) 16/17, fulcra (Lt/Rt) 15/16, middle lamellae (Lt/Rt) 7/6, and three marginal lamellae on either side; fulcra with one or two reddish microsetae; middle lamellae with 2–6 reddish microsetae, and marginal lamellae with 8–13 reddish microsetae; pectines elongate, not extending beyond coxa-trochanter joint of leg IV (Figs. 6, 9).

Metasoma and telson. Metasoma and telson sparsely hirsute, all metasomal segments longer than wide; metasomal segment I marginally longer than wide (L/W 1.05); segment II & III slightly longer than wide (L/W 1.38 and 1.52 respectively); segment IV distinctly longer than wide (L/W 1.78); segment V

more than two times longer than wide (L/W 2.17). Metasomal segment I with 10 complete carinae; II– III with 10 carinae of which lateral carinae reduced by 3–6 granules on distal part (Figs. 5–6); segment IV with 10 complete carinae, of which lateral carinae on either side are weaker; and segment V with five complete carinae; ventrolateral carinae on all segments with all granules more or less equal in size and not lobate. Intercarinal segment (excluding dorsal surface) of segments I–III moderately granulated and IV–V heavily granulated; dorsal surface of metasomal segment I with heavy granulation, becoming weaker posteriorly on rest of the segments. Vesicle bulbous and sparsely granulated except ventral surface smooth, subaculear tubercle absent, aculeus short and strongly curved (Figs. 5–6).

Pedipalps. Femur and patella sparsely hirsute with small light golden hairs and few macrosetae, chela sparsely hirsute with small black hairs. Femur with five complete carinae, two on dorsal aspect, a single carina on internal, ventral and external aspects respectively; patella with eight complete carinae, two on dorsal, internal, ventral, and external aspects

Dimensions (mm)		<i>C. satpuraensis</i> sp. n. ♀ holotype	<i>C. satpuraensis</i> sp. n. ♂ paratype
Carapace	L / Wa / Pa	4.70 / 2.19 / 4.51	4.19 / 2.09 / 3.99
Mesosoma	L	10.39	8.84
Tergite VII	L / W	2.66 / 4.69	2.62 / 4.15
Metasoma + telson	L	21.75	21.15
Segment I	L / W / D	2.76 / 2.63 / 2.19	2.65 / 2.49 / 2.27
Segment II	L / W / D	3.28 / 2.38 / 2.17	3.23 / 2.34 / 2.19
Segment III	L / W / D	3.49 / 2.29 / 2.15	3.38 / 2.29 / 2.19
Segment IV	L / W / D	3.88 / 2.18 / 2.04	3.79 / 2.23 / 2.11
Segment V	L / W / D	4.42 / 2.04 / 1.95	4.31 / 2.23 / 1.97
Telson	L / W / D	3.92 / 1.44 / 1.43	3.79 / 1.46 / 1.42
Vesicle	W / D	1.44 / 1.43	1.46 / 1.42
Pedipalp	L	15.25	14.24
Femur	L / W	3.57 / 1.26	3.49 / 1.13
Patella	L / W	4.28 / 1.67	3.88 / 1.60
Chela	L	7.40	6.87
Manus	W / D	1.64 / 1.68	1.86 / 1.90
Movable finger	L	5.10	4.56
Total	L	36.53	33.98
Pectinal teeth	left / right	16 / 17	18/17

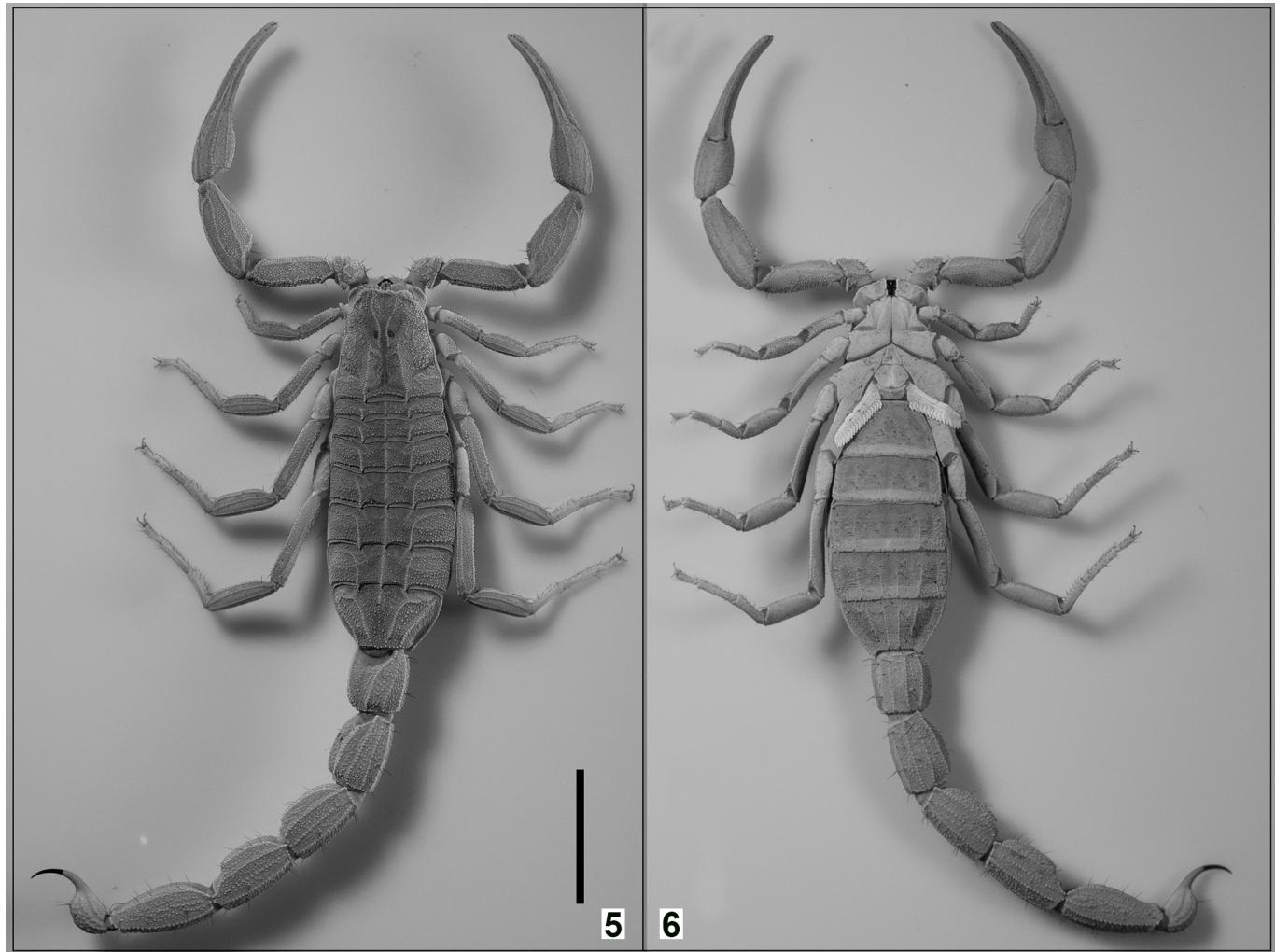
Table 1. Measurements of the types Abbreviations: L (length), D (depth), W (width), Aw (anterior width), Pw (posterior width).

respectively; chela with four complete carinae, two on dorsal aspect, a single on ventral and ventrolateral aspects; a single incomplete carina on lateroexternal and dorsoexternal aspects respectively. Movable fingers of chela with 11 or 12 cutting rows of granules and external accessory granules present at all rows with five terminal granules including single basal terminal granule (Fig. 15). Femur and patella heavily granulated, chela moderately granulated, robust, less than five times longer than wide. Trichobothrium *db* situated on the fixed finger of chela manus basal to *est* (Figs. 14–15); trichobothrial pattern Type A (Figs. 14–18), Orthobothrioxic, dorsal trichobothria of femur arranged in β configuration (Fig. 17).

Legs. Femur of all legs with four distinctly marked carinae, two on dorsal and ventral aspect respectively; patella of all legs with five distinctly marked carinae, two on dorsal and external aspects respectively, ventral aspect with a single distinctly marked carina, flanked externally by an irregular row of small granules; tibia and tarsomere I of all legs with four moderately to distinctly marked granular carinae, two on dorsal and ventral aspects respectively (Figs. 5–6). Trochanter heavily granulated, intercarinal tegment of femur heavily granulated, patella moderately granulated, intercarinal tegument of tibia without granules; legs III–IV with small to moderate sized tibial spurs. Ventral surface of tarsomere II of legs I–IV with two ventrosubmedian rows of short spiniform setae without median rows of spinules; legs I–II with four or five setae in each row and legs III–IV with 6–8 setae in each row. Single pair of pedal spurs present on tarsomere II of all legs; median and lateral claws present in all legs.

Coloration of holotype (in preservation). (Figs. 3–4) Carapace yellowish brown, black pigments between median eyes and around the lateral eyes. Tergite brownish overall, distal half darker and proximal half much paler in tergites I–VI, VII paler entirely. Metasomal segments I–V yellowish brown. Paler blackish zones present over carinae of all metasomal segments. Vesicle yellowish brown with base of aculeus reddish brown and tip reddish black. Femur and patella of pedipalps yellowish brown, chela yellowish, fingers yellowish brown, tips of fingers yellowish. Sternites I–V yellowish brown. All legs of coxa-trochanter, femur and patella yellowish brown, tibia and tarsomeres I–II yellowish; tip of lateral and median claws reddish.

Variation. (Figs. 7, 11–13, 19–20) Paratype is in good condition except a 1.47 mm longitudinal injury near base of movable finger on left chela of pedipalp, an additional small ocellus on right side of lateral eye and left row of pectinal teeth bend towards left. Mensural data and pectinal teeth count for the paratype is given in the Table 1. The male paratype agrees with the holotype in overall morphology except for chela fingers twisted at base and coloration in preservation: carapace reddish brown, tergite dark brown overall, distal half darker and proximal half much paler in tergites I–VI; VII paler entirely. Metasomal segments I–IV yellowish brown; segment V reddish brown. Femur and patella of pedipalps reddish brown, chela yellowish brown, fingers reddish brown. Sternites I–V and all legs of coxa-trochanter, femur and patella reddish brown.

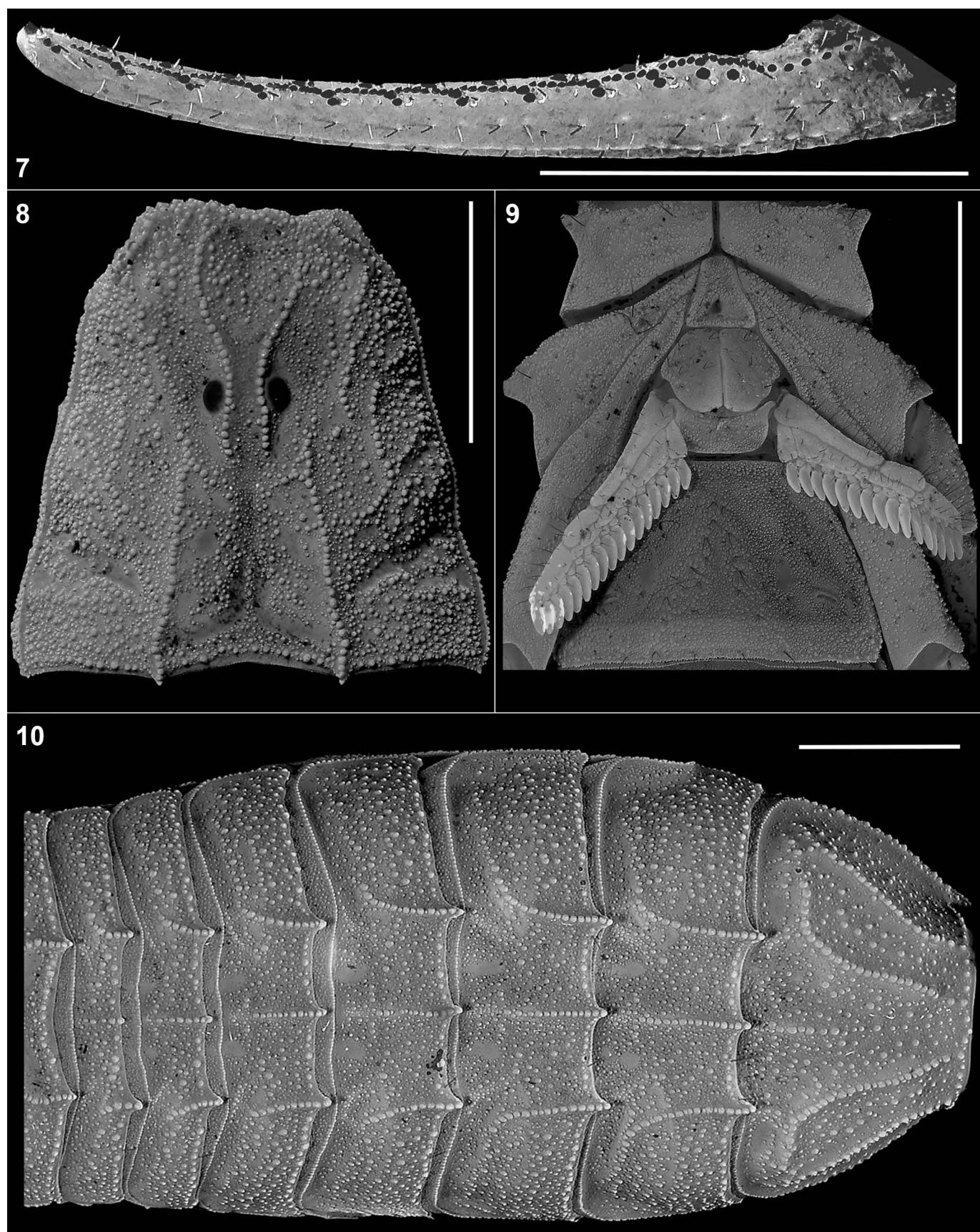


Figures 5–6. *Compsobuthus satpuraensis* sp. n., female holotype, in dorsal (5) and ventral (6) views under ultraviolet light. Scale bars = 5 mm.

AFFINITIES. Based on presence of external accessory granules at cutting rows of movable finger of chela pedipalp, *Compsobuthus satpuraensis* sp. n. is a member of *werneri* group and can be easily differentiated from all four species of the group (expect *C. rugosulus*) known from India and Pakistan by following non-overlapping morphological characters: pectinal teeth count 16–18 (*versus* 26 in *C. atrostriatus*); chela manus moderately granulated (*versus* chela manus smooth in *C. atrostriatus*); metasoma II–III with 10 carinae of which lateral carinae reduced by 3–6 granules on distal part (*versus* lateral carinae of metasomal segment II present only on posterior part and segment III present only on one-fourth portion of posterior part in *C. atrostriatus*; lateral carinae of segment II with less than 10 granules, situated mainly in posterior half, and segment III with only two or three granules situated on posterior sides in *C. pakistanus*); chela robust; less than five times longer than wide in both sexes (*versus* chela slender; seven times longer than wide in female of *C. pakistanus*); metasomal segment IV less than two times longer than wide in both sexes (*versus* metasomal segment IV more than two times longer than wide in *C. pakistanus*); metasomal segment I longer than wide in both sexes (*versus* segment I as long as wide in male but wider than long in female of *C.*

sindicus) patella of pedipalps with eight carinae (*versus* patella of pedipalps with seven carinae in *C. sindicus*); metasomal segment V more than two times longer than wide in both sexes (*versus* segment V less than two times longer than wide in female of *C. sindicus*).

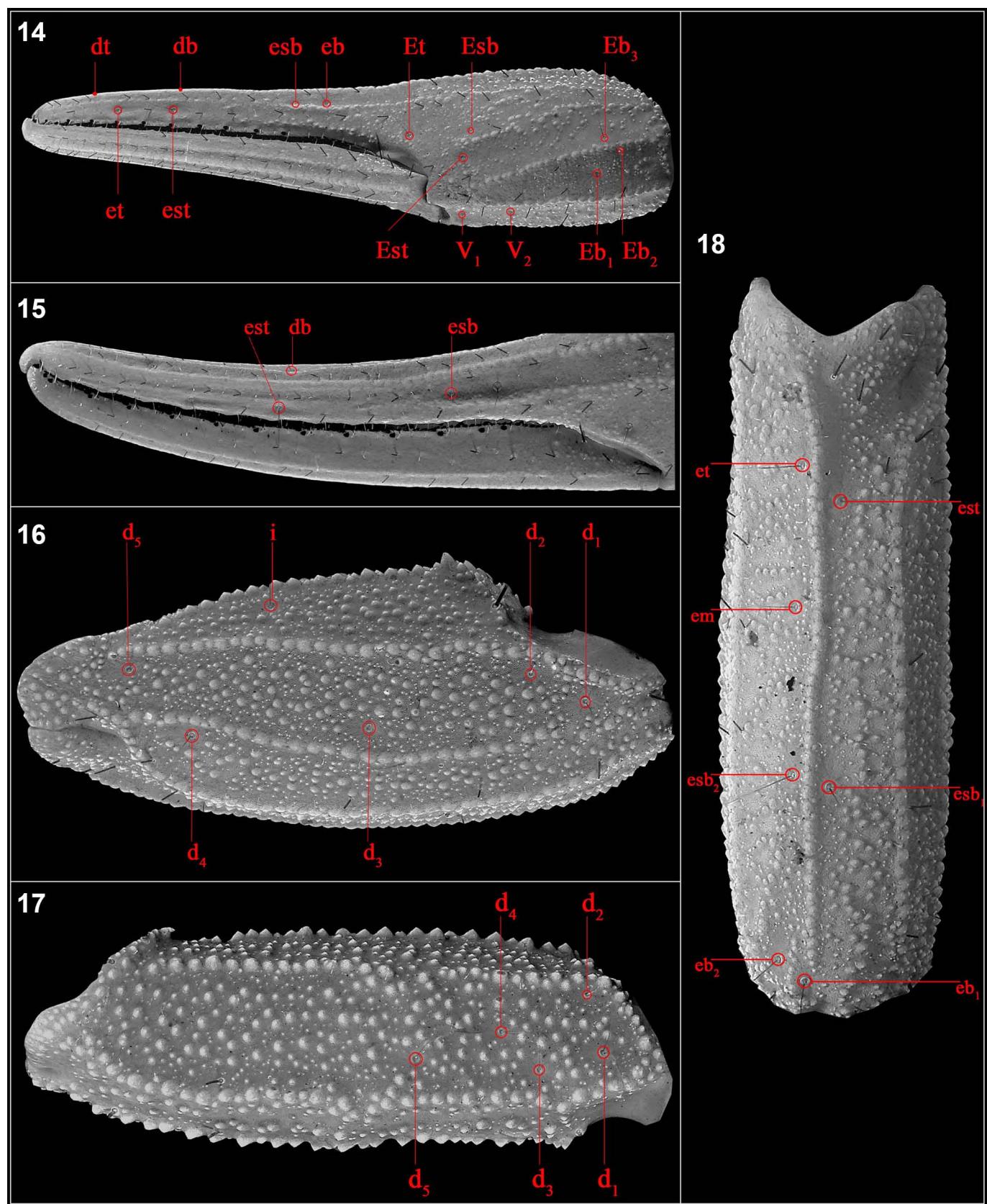
C. satpuraensis sp. n. is morphologically close to *C. rugosulus*; however, it can be distinguished from the latter by following non-overlapping morphological characters: metasomal segment V entirely reddish brown (*versus* metasomal segment V entirely pale yellow); patella with eight carinae (*versus* patella with seven carinae); chela with four complete carinae and two incomplete carinae (*versus* chela with seven or eight carinae); chela length-width ratio 4.51 in female (*versus* chela length-width ratio 4.00 in female); median eyes situated in the ratio 1:1.35 (*versus* median eyes situated in the ratio 1:1.50); sternites II–III with two granular carinae (*versus* carinae completely absent on sternites II–III); metasoma II–III with 10 carinae of which lateral carinae reduced by 3–6 granules on distal part (*versus* metasoma II–III with 10 complete carinae); carapace longer than wide in both sexes (*versus* carapace wider than long in both sexes); carapace longer than patella in both sexes (*versus* carapace shorter than patella in male); tibia and tarsomere I of all legs with granular carinae (*versus*



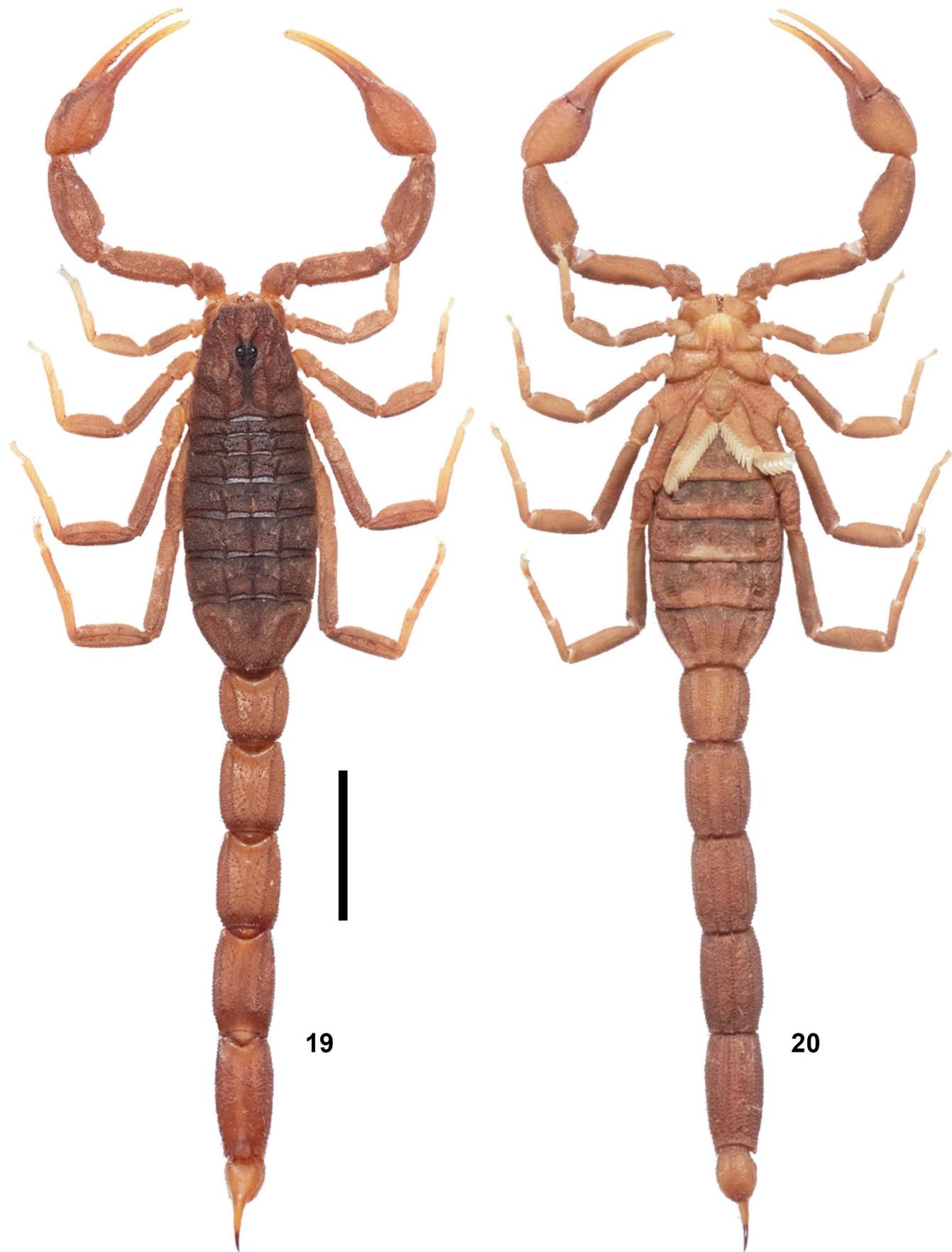
Figures 7–10: *Compsobuthus satpuraensis* sp. n., under UV light. **Figure 7.** Male paratype, movable finger of pedipalp chela. **Figures 8–10.** Female holotype. **Figure 8.** Carapace, dorsal view. **Figure 9.** Sternopectinal area. **Figure 10.** Mesosoma, dorsal view. Scale bars = 2 mm.



Figures 11–13. *Compsobuthus satpuraensis* sp. n., male paratype, metasoma and telson in dorsal (11), lateral (12) and ventral (13) views.
Scale bar = 10 mm.



Figures 14–18: *Compsobuthus satpuraensis* sp. n., male paratype, trichobothrial pattern of the left pedipalp. **Figures 14–15.** Pedipalp chela external (14) and dorsoexternal (15) views. **Figures 16, 18.** Patella in dorsal (16) and external (18) views. **Figure 17.** Femur in dorsal views.



Figures 19–20. *Compsobuthus satpuraensis* sp. n., male, paratype, in dorsal (19) and ventral (20) views. Scale bars = 5 mm.



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Figures 21–22: *Compsobuthus satpuraensis* sp. n. Figure 21. Open scrub habitat at the type locality. Figure 22. Map of India showing both localities.

tibia and tarsomere I of all legs with smooth carinae); carapace longer than metasoma V in female (*versus* carapace as long as metasoma V).

DISTRIBUTION AND NATURAL HISTORY. *C. satpuraensis* sp. n. is currently known only from two localities within ~30 km aerial distance in Yawal Tehsil, Jalgaon District of Maharashtra. The female holotype was found under a rock in the afternoon (1300–1500 hrs.) from an open scrub habitat surrounded by dry deciduous forest near the Waghzira Village at 310 m a. s. l. (Fig. 21). The male paratype was also collected from under a rock in the afternoon (1300–1500 hrs.) from an open scrub habitat near the Khiroda Village, approximately 30 km east in aerial distance from the type locality (Fig. 22). A single juvenile was seen under the same rock as male paratype, which indicates that species might breed in the month of October. Both localities are situated at foothills of Satpura hills, close to Yawal Wildlife Sanctuary. Dominant flora species at both localities are *Lantana camara* Linné, 1753, *Tectona grandis* Linné, 1782, *Azadirachta indica* Juss, 1830 and *Senegalia chundra* Roxb. ex Rottler Maslin, 1806. *Hottentotta cf. tamulus* (Fabricius, 1798) was the only other scorpion species recorded sympatrically with the new species.

Discussion

C. satpuraensis sp. n. is only the second species of the genus *Compsobuthus* to be described from India, as well as fourth to be known from India. It is also the first species of the genus to be reported from Maharashtra, and extends the known distribution range of the genus by ~ 600 km southwest and southeast from Gwalior in Madhya Pradesh (*C. rugosulus*) and Jodhpur District in Rajasthan (*C. atrostriatus*,) respectively.

The new species is a member of *werneri* group and raises the number of known species in the group distributed in the Indian subcontinent to five. *C. humaae* was described from Digri in Sindh, Pakistan by Amir et al. (2005); however, Kovářík & Ahmed (2007) considered its taxonomic position questionable without clarification. Later, Kovářík & Ojanguren (2013) proposed *C. humaae* as a *nomen dubium*. Hence, we have excluded it from the comparison section. *C. atrostriatus* was first described by Pocock (1897) as *Buthus atrostriatus* from Kashmor Bund in upper Sindh (now in Pakistan). Later, Tikader & Bastawade (1983) reported it from Jodhpur, Rajasthan, India (~ 400 km east in aerial distance from the type locality) and placed it in the genus *Vachonus* Tikader & Bastawade, 1983. Finally, Navidpour et al., (2011) transferred the species to the genus *Compsobuthus*. *C. rugosulus* is another species, which was first described by Pocock (1900) (as a subspecies of *Buthus acutecarinatus* Simon, 1882), based on the specimens collected from Hyderabad, Sindh, Pakistan and Gwalior, Madhya Pradesh, India. The two localities are ~1000 km apart in aerial distance. Subsequently, Tikader and Bastawade (1983) reported it from Rajasthan and Gujarat States of India. Lourenço & Monod (1998) redescribed it and elevated to the species based on topotypes from Hyderabad, Sindh in

Pakistan, and considered it as a type locality. However, detailed morphological examination of museum specimens of both *C. atrostriatus* and *C. rugosulus* from India are needed to ascertain whether the records of these species from the country are valid or represent additional undescribed species.

First report of the genus *Compsobuthus* from Maharashtra with the discovery of *C. satpuraensis* sp. n. indicates that the genus could be more widely distributed than previously recorded. Additional dedicated field surveys targeting suitable areas especially in northern and central India might further expand the known range of the genus as well as likely to uncover potential undescribed species.

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